Diese Website verwendet Cookies von Google, um Dienste anzubieten und den Traffic zu analysieren. Deine IP-Adresse und dein User-Agent werden zusammen mit Messwerten zur Leistung und Sicherheit für Google freigegeben. So können Nutzungsstatistiken generiert, Missbrauchsfälle erkannt und behoben und die Qualität des Dienstes gewährleistet werden.

WEITERE INFORMATIONEN OK

Tuesday, April 14, 2009

Polynesians vs. Adam Smith

Adam Smith observed how even the most basic of products in 1776, at the dawn of the industrial revolution in Britain, depended, directly and indirectly, on the work of thousands of people:

> Observe the accommodation of the most common artificer or day-laborer in a civilized and thriving country, and you will perceive that the number of people of whose industry a part, though but a small part, has been employed in procuring him this accommodation, exceeds all computation. The woollen coat, for example, which covers the day laborer, as coarse and rough as it may appear, is the produce of the joint labor of a great multitude of workmen. The shepherd, the sorter of the wool, the wool-comber or carder, the dyer, the scribbler, the spinner, the weaver, the fuller, the dresser, with many others, must all join their different arts in order to complete even this homely production. How many merchants and carriers, besides, must have been employed in transporting the materials from some of those workmen to others who often live in a very distant part of the country! How much commerce and navigation in particular, how many shipbuilders, sailors, sailmakers, ropemakers, must have been employed in order to bring together the different drugs made use of by the dyer, which often come from the remotest corners of the world! What a variety of labor, too, is necessary in order to produce the tools of the meanest of those workmen! To say nothing of such complicated machines as the ship of the sailor, the mill of the fuller, or even the loom of the weaver, let us consider only what a variety of labor is requisite in order to form that very simple machine, the shears with which the shepherd clips the wool. The miner, the builder of the furnace for smelting the ore, the feller of the timber, the burner of the charcoal to be made use of in the smelting-house, the brickmaker, the bricklayer, the workmen who attend the furnace, the millwright, the forger, the smith, must all of them join their different arts in order to produce them. Were we to examine, in the same manner, all the different parts of his dress and household furniture, the coarse linen shirt which he wears nest his skin, the shoes which cover his feet, the bed which he lies on, and all the different parts which compose it, the kitchen grate at which be prepares his victuals, the coals which he makes use of for that purpose, dug from the bowels of the earth, and brought to him perhaps by a long sea and a long land carriage, all the other utensils of his kitchen, all the furniture of his table, the knives and forks, the earthen or pewter plates upon which he serves up and divides his victuals, the different hands employed in preparing his bread and his beer, the glass window which lets in the heat and the light, and keeps out the wind and the rain, with all the knowledge and art requisite for preparing that beautiful and happy invention, without which these northern parts of the world could scarce have afforded a very comfortable habitation, together with the tools of all the different workmen employed in producing those different conveniences; if we examine, I say, all these things, and *consider what a variety of labor is employed about each of them, we shall be sensible that*

Pages

- Home

About Me

Nick Szabo

"A premier thinker about history, law and economics, and the lessons they have for security." -- Adam Shostack, Emergent Chaos

"Szabo comes out with these essays that leave me in awe." -- Brian Dunbar

"Reading material that is eclectic, challenging and endlessly fascinating." -- Sean McGrath, Propylon

"Like most blogs worth my attention, this blog is updated only infrequently. That is because the authors of blogs worth my attention only post when they have something to say that is true, relevant and not already known by their audience. Most of the human race does not have the skill to know when an idea has these three properties. The skill is particularly rare in the fields of politics and economics, which is why this blog is such a rare and valuable thing." -- Richard Hollerith

View my complete profile

> *without the assistance and co-operation of many thousands, the very meanest person in a civilized country could not be provided* [emphasis added], even according to what we may falsely imagine the easy and simple manner in which he is commonly accommodated.

Leonard Read used the pencil as an even more startling example of how a simple 20th century product depended on a vast global network of economic relations. The number of people required, directly and indirectly, to manufacture a high-technology device, such as a cellphone or laptop computer, is probably in the millions. Friedrich Hayek explained the fine-grained division of labor that makes modern technology and wealth possible as a division of knowledge in "The Use of Knowledge in Society":

> The peculiar character of the problem of a rational economic order is determined precisely by the fact that the knowledge of the circumstances of which we must make use never exists in concentrated or integrated form but solely as the dispersed bits of incomplete and frequently contradictory knowledge which all the separate individuals possess. The economic problem of society is thus not merely a problem of how to allocate "given" resources—if "given" is taken to mean given to a single mind which deliberately solves the problem set by these "data." It is rather a problem of how to secure the best use of resources known to any of the members of society, for ends whose relative importance only these individuals know.

Yet there existed a culture, the pre-European Polynesians, which established self-sufficient economies sometimes not totalling more than a few hundred people on dozens of small islands int the Pacific. Due to the small number of people that made up a self-sufficient economy, they did it using technology and institutions radically different from the agricultural civilizations of the Eurasian continent where they had come from. The Polynesians did not work metal: metalworking (for example the mining, smelting, smithing, etc. required to extract and work iron) requires too much of a division of labor. They used only the materials readily available on a South Seas island: their houses, ovens, boats, weapons, etc. were all made out of plants, stones, and animal parts. Since they lived at a Malthusian equilibrium (which almost every culture lived under until northwest Europe in the 17th century started a long climb out of it), their standard of living was on average the same as the world average -- dirt poor by our standards. This was enough, however, to produce catamarans that could navigate the South Pacific long before Magellan and Cook.

Small island economies greatly increased the premium and resulting emphasis on trade between islands in Polynesia and Melanesia (the Melanesians were an earlier group of island settlers). When inter-island trade was feasible, large proportions of resources and attention went into it. The kula ring was a splendid example of a sophisticated trade institution that developed among some of the Melanesians.

What's more, the Polynesians could do something that we moderns cannot -- replicate their entire economy from one island to another by packing up their families, along with a variety of plants and a handful of animals, onto a handful of catamarans. Could we similarly replicate our entire modern global economy, or a set of tools that could produce an equivalent result, to, say, another planet on a handful of rockets? That was the ambition of K. Eric Drexler's nanotechnology: pack a rocket full of "assemblers": self-replicating robots that can make almost anything. In the mid-20th century, mathematician and computer scientist John Von Neumann sketched a theoretical model of a self-replicating machine -- a self-replicating pattern in the 2-dimensional world of "cellular automata" (where, among other simplifications, copy operations come for free). I have long been skeptical of the idea that physical self-replication can be done with a simple design:

> While going from macroscopic industrial parts proposed by von Neumann, or the nucleic acids, amino acids and myriad of tertiary biochemicals in bacteria, to atomic-scale diamondoid parts reduces the search space, and thus complexity, but this also reduces the degrees of design freedom. It could be that the search space of diamondoid replicators is so small that there is no possible configuration of, say, 10 million carbon atoms can copy itself in practice, when we get down to the details of atomic placement in each operation. A particularly difficult task in atomic placement for one small segement of a Stewart platform (eg assembling the ratchet complex) may necessitate a blowup in the complexity of the

Blog Archive

- ► 2018 (1)
- ► 2017 (3)
- ► 2016 (4)
- ► 2015 (3)
- ► 2014 (3)
- ► 2013 (3)
- ► 2012 (8)
- ► 2011 (12)
- ► 2010 (9)
- ▼ 2009 (29)
  - ► November (3)
  - ► October (6)
  - ► September (3)
  - ► August (1)
  - ► July (1)
  - ► June (3)
  - ► May (6)
  - ▼ April (3)
    - Separation of powers and credible commitment
    - Polynesians vs. Adam Smith
    - Money and the efficiency of plunder
  - ► January (3)
- ► 2008 (55)
- ► 2007 (47)
- ► 2006 (130)
- ► 2005 (44)

> platform itself or in the machinery that brings molecules to and places them for the platform. To be truly self-replicating we need to close all the loops in the graph of operations. Attempts to close the last 1% ("vitamins") might introduce even more open loops than we close. The minimum complexity might easily exceed the degrees of freedom in the search space, in which case a solution does not exist.

The seeming simplicity of the the small-island Polynesian economy, lacking a sophisticated division of production and distribution operations and thus lacking a highly complex division of knowledge, is in one sense an illusion. This simplicity was made possible by making intensive use of very high evolved plant life. The complexity of life is extremely high. The self-sufficiency of the pre-European Polynesian economy is only possible if agriculture can be productively accomplished with tools made by the farmer or his friends. There is no simple design of a pan-assembler or self-replicating device -- the simplest ones we know of, life, are of extremely high complexity, and it will be a long time before we create new versions of life, much less artificial self-replicating machinery, in a lab.

Partially self-replicating machines are, of course, quite possible. The actual direct and indirect labor required for these machines, like those required for laptops and cell phones, is in the millions of people, and for many of the same reasons -- these machines are based on sophisticated microchips and plastics, among other parts of complex origin. Even if we radically redesigned every tool and machine we have for our hypothetical self-sufficient extraterrestrial economy -- and such radical redesign would be utterly necessary -- it would still likely require hundreds of thousands of people and gigatonnes of machinery, at least, to have a wealthy yet self-sufficient economy beyond earth.

Take Smith's coat and Read's pencil, elaborate the required network still further for today's complex products, and multiply by many thousands of products -- that is what is required to fill the shelves of your hardware super-store (in the U.S., Home Depot and Lowe's). Do this again for your drugstore, your clothing store, etc. You'd have no such super-stores in our space colony. It would in many ways be quite poor by earth standards.

The Polynesians relied on the ready availability of high-evolved life that could readily be grown in the native environment (no complex artificial creations like Plexiglass domes or grow-lights needed), and yet were dirt-poor by our standards. Modern products generally require elaborate divisions of labor necessarily involving millions of people. Such an economy cannot be planned, as numerous attempts to do so demonstrated in the 20th century. A modern economy requires a decentralized information-transmitting mechanism such as a market to work. In sharp contrast to the Polynesian small-island economy, our global economy cannot be easily replicated. We have to make it work here, or nowhere.

Posted by Nick Szabo at 3:24 PM

3 comments:

Anonymous said...

Interesting post, odd conclusion. Would you say that if modern Europe had just discovered America today, that it would be incapable of colonizing it?

I suspect not. In more familiar territory, it's clear how colonization really works: not by picking up your entire society and replicating it in one fell swoop, but by a gradual process, involving countless actions by individual players in the market.

The same thing will happen for space colonization, once lost costs get cheap enough to make it economical (and there are a number of technologies that could do that).

10:34 PM

Anonymous said...

Excuse me, "launch costs."

10:36 PM

nick said...

Would you say that if modern Europe had just discovered America today, that it would be incapable of colonizing it?
Obviously I would not say any such thing. Observe that my hypothetical was a fully self-sufficient space colony, like those of some of the remoter and smaller Polynesian islands, not of a space colony per se.

First of all, the American colonies were not fully self-sufficient. They imported a wide variety of manufactured goods from Britain and exported a wide variety of wood-derived products, sugar (in the West Indies), cotton, etc. Second and more importantly, as with the South Sea islands settled by the Polynesians, a rich native ecosystem already existed, and it would not have required a modern industrial infrastructure to establish self-sufficient communities, albeit these communities, lacking the manufactured goods of Britain, would have been poorer than the actual American colonies. No such native ecosystem exists beyond earth in our solar system. Modern industrial technologies and materials, based on a vast division of labor, are required to start a colony beyond earth, an a thorough and unimaginably complex redesign of practically every tool and machine to be used on the colony will be needed before it can become even remotely close to self-sufficient. Even then the colony without substantial exports to and imports from earth will be much poorer than earthside developed countries due to the relative lack of division of labor.

Thus my conclusion that we won't be setting up any independent economies any time soon -- we have to keep our global economy working here.

Your launch cost comment takes us well beyond the scope of my article, but given the history of transportation costs and technologies over the last fifty years, including the many claims to dramatically lower launch costs, and the vast attention and resources that have gone into such efforts, that have all fizzled out, I'm highly skeptical about such predictions. A more promising approach is the road less traveled by futurists: to search for ways to use native space environments to find or do things we can't easily do or find on earth, and then export them to earth in a high value/mass ratio form, in a way that makes money at current launch costs. Currently and for the near future this is limited to obtaining, transmitting, and relaying information, which has practically infinite value/mass. Such businesses will be deeply integrated with earth's economy. They are not likely to be politically autonomous, much less economically self-sufficient.

5:27 PM

Post a Comment

Newer Post Home Older Post

Subscribe to: Post Comments (Atom)

Simple theme. Powered by Blogger.